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(54) **GRADIENT ELUTION MOVING BOUNDARY ELECTROPHORESIS FOR USE WITH COMPLEX SAMPLES AND DETECTION OF TOXINS**

(75) Inventors: **Alyssa Catharyn Henry**, Arlington, VA (US); **David Judson Ross**, Silver Spring, MD (US)

(73) Assignee: **Applied Research Associates, Inc.**, Albuquerque, NM (US)

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CPC ***G01N 27/44713*** (2013.01); ***B01D 57/02*** (2013.01); *G01N 27/4473* (2013.01); *G01N 2030/285* (2013.01)

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See application file for complete search history.

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Primary Examiner — Luan Van
Assistant Examiner — Maris R Kessel
(74) *Attorney, Agent, or Firm* — Dinsmore & Shohl LLP

(57) **ABSTRACT**

Methods of detecting the presence of toxins in a sample using electrophoretic separations and of performing electrophoretic separation of complex samples are provided. The method of detecting the presence of toxins includes reacting a sample and a substrate with a signaling enzyme which converts the substrate to the product in a reaction medium, introducing a run buffer into a separation channel having an inlet end, selectively introducing at least one of the substrate and the product of the reaction medium into the inlet end of the separation channel, electrophoretically separating the substrate and the product, and determining the rate of conversion of the substrate to the product, wherein a change in the rate of conversion is indicative of the presence of toxins. The method of performing electrophoretic separations of complex samples having charged particulates and oppositely charged analytes comprising introducing a run buffer into a separation channel having an inlet end, selectively introducing the oppositely charged analytes in the complex sample into the separation channel, and electrophoretically separating the charged particulates and the oppositely charged analytes. Additionally, a device for varying with respect to time the bulk flow of a fluid in a separation channel of an electrophoretic device having a buffer reservoir in fluid contact with the separation channel is provided. The device includes a pressure sensor in fluid contact with a buffer reservoir, a high pressure reservoir in selective fluidic communication with the buffer reservoir, a low pressure reservoir in selective fluidic communication with the buffer reservoir and in fluidic communication with the high pressure reservoir, and a pumping device for pumping a gas from the low pressure reservoir to the high pressure reservoir.

20 Claims, 18 Drawing Sheets